

1        CLAIMS

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3        1. A cylinder head assembly comprising a cylinder  
4        head having an inlet passage and an outlet passage  
5        for communication, in use, with a cylinder, and at  
6        least one rotatably mounted shaft member interposed  
7        between the inlet and outlet passages and the  
8        cylinder, the shaft member(s) having passage means  
9        to allow an ingress of air mixture from the inlet  
10      passage to the cylinder at a first desired  
11      rotational position, and to allow an egress of  
12      combusted gases from the cylinder through the outlet  
13      passage at a second desired rotational position and  
14      to prevent the air or combusted gases from entering  
15      or exiting the cylinder at a third desired  
16      rotational position.

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18      2. A cylinder head assembly according to claim 1,  
19      in which there are two shaft members, one  
20      cooperating with the inlet passage and one with the  
21      outlet passage.

22

23      3. A cylinder head assembly as claimed in claim 2,  
24      in which the shaft members are coupled, in use, to a  
25      crankshaft with means for independently controlling  
26      or adjusting the speed of rotation of said shaft  
27      members.

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29      4. A cylinder head assembly as claimed in claim 2,  
30      in which the shaft members are driven independently  
31      of the crankshaft, and of each other, with means for

1       individually controlling or adjusting the speed of  
2       rotation of said shaft members.

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4       5. A cylinder head assembly according to any  
5       preceding claim, in which the shaft member or each  
6       shaft member is substantially solid.

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8       6. A cylinder head assembly according to claim 5,  
9       in which the passage means comprises a recess in the  
10      shaft member or a respective recess in each of the  
11      shaft members.

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13      7. A cylinder head assembly according to claim 2,  
14      in which each shaft member is hollow; each shaft  
15      member having at least one aperture located around a  
16      portion of its circumference, wherein the inlet  
17      shaft member allows an ingress of air/fuel mixture  
18      from the inlet shaft member to enter said cylinder  
19      when the aperture in the inlet shaft is presented to  
20      the cylinder, and the outlet shaft member allows an  
21      egress of combusted gases to exit the cylinder when  
22      the aperture in the outlet shaft member is presented  
23      to the cylinder.

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25      8. A cylinder head assembly according to claim 7,  
26      in which each shaft member is provided with an inner  
27      hollow tube member rotatably mounted within said  
28      shaft member; each inner tube member having at least  
29      one aperture located around a portion of its  
30      circumference; rotation of said inner tube member  
31      within the respective hollow shaft members providing  
32      a variable size effective aperture, which allows a

1 variable ingress of combustion air to enter said  
2 cylinder through the effective aperture in the inlet  
3 shaft member, and allows a variable egress of  
4 combusted gases from the cylinder to exit through  
5 the effective aperture in the outlet shaft member.

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7 9. A cylinder head assembly according to claim 8,  
8 in which the speed of rotation of the inner and  
9 outer tube members are such that the effective  
10 aperture maximises or restricts the rate of ingress  
11 of air, or egress of exhaust gases, through the  
12 respective inner tube members.

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14 10. A cylinder head assembly as claimed in claim 8  
15 or claim 9, in which the inner tube members are  
16 coupled, in use, to a crankshaft with means for  
17 independently controlling or adjusting the speed of  
18 rotation of said tube members.

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20 11. A cylinder head assembly as claimed in claim 8  
21 or claim 9, in which the tube members are driven  
22 independently of the crankshaft, and of each other,  
23 with means for individually controlling or adjusting  
24 the speed of rotation of said tube members.

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26 12. A cylinder head assembly according to any  
27 preceding claim, in which the shaft member(s) extend  
28 over a number of cylinders, the shaft member(s)  
29 having a corresponding number of passage means.

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1       13. A cylinder head assembly according to any  
2       preceding claim, in which the shaft member(s) have  
3       gas tight seal assemblies.

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5       14. A method of allowing an ingress and egress of  
6       combustion air and combusted gases from a cylinder  
7       comprising the steps of:

8           presenting a passage means within a shaft  
9       member to an inlet passage;

10           retracting of a piston within a cylinder to  
11       allow an induction of air from the inlet passage  
12       through said passage means into the cylinder;

13           rotating the shaft member to prevent any  
14       leakage of air upon a compression of the air in the  
15       cylinder by the piston;

16           combusting air/fuel mixture in the cylinder to  
17       cause said piston to retract;

18           extending the piston in the cylinder;

19           presenting passage means to the cylinder and  
20       an outlet passage to allow an egress of combusted  
21       gases; and

22           repeating the above steps.

23

24       15. A method according to claim 14, in which the  
25       same passage means is used for induction and egress.

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27       16. A method according to claim 14, in which the  
28       passage means is formed by an aperture in at least  
29       one hollow shaft, and the method further includes  
30       the step of varying the effective size of the  
31       aperture to restrict or maximise the amount of fluid  
32       flow through the aperture.